Catalogue of American Amphibians and Reptiles.

Beaman, K.R. and L.L. Grismer. 1994. *Crotalus enyo*.

Crotalus enyo (Cope)
Baja California Rattlesnake

Caudisona enyo Cope, 1861 (1862):293. Type-locality, "inhabits Lower California," collected at "Cape St. Lucas" (=Cabo San Lucas, Baja California Sur, México). Lectotype here designated as Academy of Natural Sciences of Philadelphia (ANSP) 7159, an adult male collected by John Xantus in May-June 1859 (see Remarks).
Crotalus enyo: Cope, 1875:33.
Crotalus viridis var. *enyo*: Garman, 1884:174.
Crotalus confluentus enyo: Amarál, 1930 (1929):94.

• **Content.** Three subspecies are recognized: *enyo*, *cerralvensis*, and *furvus*.

• **Definition.** *Crotalus enyo* is a medium-sized rattlesnake, with a maximum recorded length of 898 mm. The scutellation is as follows: midbody dorsal scale rows 23-27 (usually 25); ventrals 157-181(159-168, males; 161-177, females); subcaudals 18-31(22-28 in males and 18-23 in females); supralabials 12-15 (usually 13-14); infralabials 11-16 (usually 13 or 14); interoculabials 1 or 2 (usually 1); preoculars 2-3; intersupraoculars 2-6 (usually 4-5); loreals 1-8 (usually 2-3); internasals 2; canthals 2. The rostral is usually wider than high and is in contact with the prenasal (two internasals are also in contact with the rostral). The prenasal may be in contact with the supralabials, but is sometimes separated from it by the presence of anterior prefoveals. The lacunals may contact the supralabials or may be wholly or partially separated from them by 1-3 subfoveals. The internasal-prefrontal area is covered with 13-25 scales and 2-6 intersupraoculars are present. The supraoculars are elevated at the outer edges. Scales in the prefrontal-frontal region tend to be rough and knobby. The upper preocular usually is not in contact with the postnasal, contact is prevented by the presence of 1-5 loreals (usually 2-3).

Ground color is tan, pale to dark brown, gray-brown, or silvery gray, becoming paler posteriorly. The 28-42 dorsal body blotches are reddish to yellowish brown, black-edged, and subrectangular anteriorly but change to hexagons at midbody. A distinct pale bar extends across the supraoculars, and small dark spots are present in the anterior parietal area. A postocular stripe extends posteriorly behind the eye to the angle of the jaw. On each side of head, an elongated outer parietal blotch extends posteriorly from behind the supraoculars to the posterior parietal region; each is followed by a nuchal stripe. The posterior part of the parietal blotches often merge with the anterior portion of the respective nuchal stripes, forming a pair of large irregular stripes that extend from the supraocular well onto the body. The belly is cream colored and buff or heavily mottled, dotted with gray or brown. The tail has 4-8 brownish rings on a gray ground color. The proximal rattle segment usually is black.

• **Diagnosis.** *Crotalus enyo* may be distinguished from all other congeners by having a relatively narrow head (for a rattlesnake), large eyes, supraoculars that slant notably upward, and body blotches down the back, with each having a black or dusky spot close to or attached to the lower border on each side, especially from midbody toward the tail.

• **Descriptions.** Descriptions of *Crotalus enyo* were published by Cope (1861, 1887, 1900), Garman (1884), Van Denburgh (1895, 1922), Amarál (1929), Klauber (1931), Ditmars (1936, 1939), Gloyd (1940), Stebbins (1985), and Campbell and Lamar (1989). Morphological and geographical variation were discussed by Lowe and Norris (1954) and Cliff (1954).

• **Illustrations.** Cope (1900) illustrated dorsal, ventral, lateral, and frontal views of the head, a view of the vent region, and a lateral view of the body. A line drawing showing a lateral view of the head is in Mocquard (1909). Klauber (1936a) published a line drawing of the dorsal view of the head. Wright and Wright (1957) displayed line drawings illustrating lateral views of the head and tail. Line drawings of a lateral view of the head and midbody were included by Stebbins (1985). Van Denburgh (1922) published a black and white photograph of a section of dorsal skin illustrating scalation and color pattern. Black and white photographs of adults appeared in Klauber (1931, 1936a, 1956, 1972, 1982), Gloyd (1940), Wright and Wright (1957), Armstrong and Murphy (1979), and Grismer et al. (1994). Black and white photographs depicting all three subspecies appeared in Harris and Simmons (1978) and Glenn and Straight (1982). Black and white photographs of the holotypes of *Crotalus e. furvus*

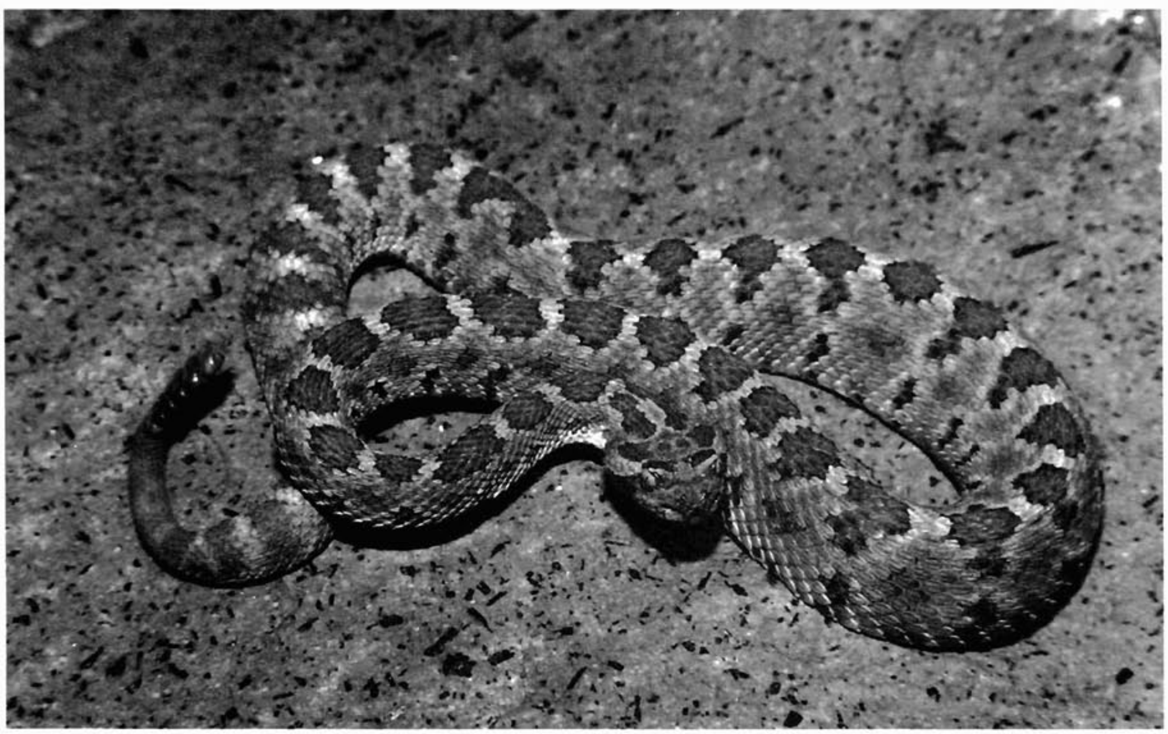
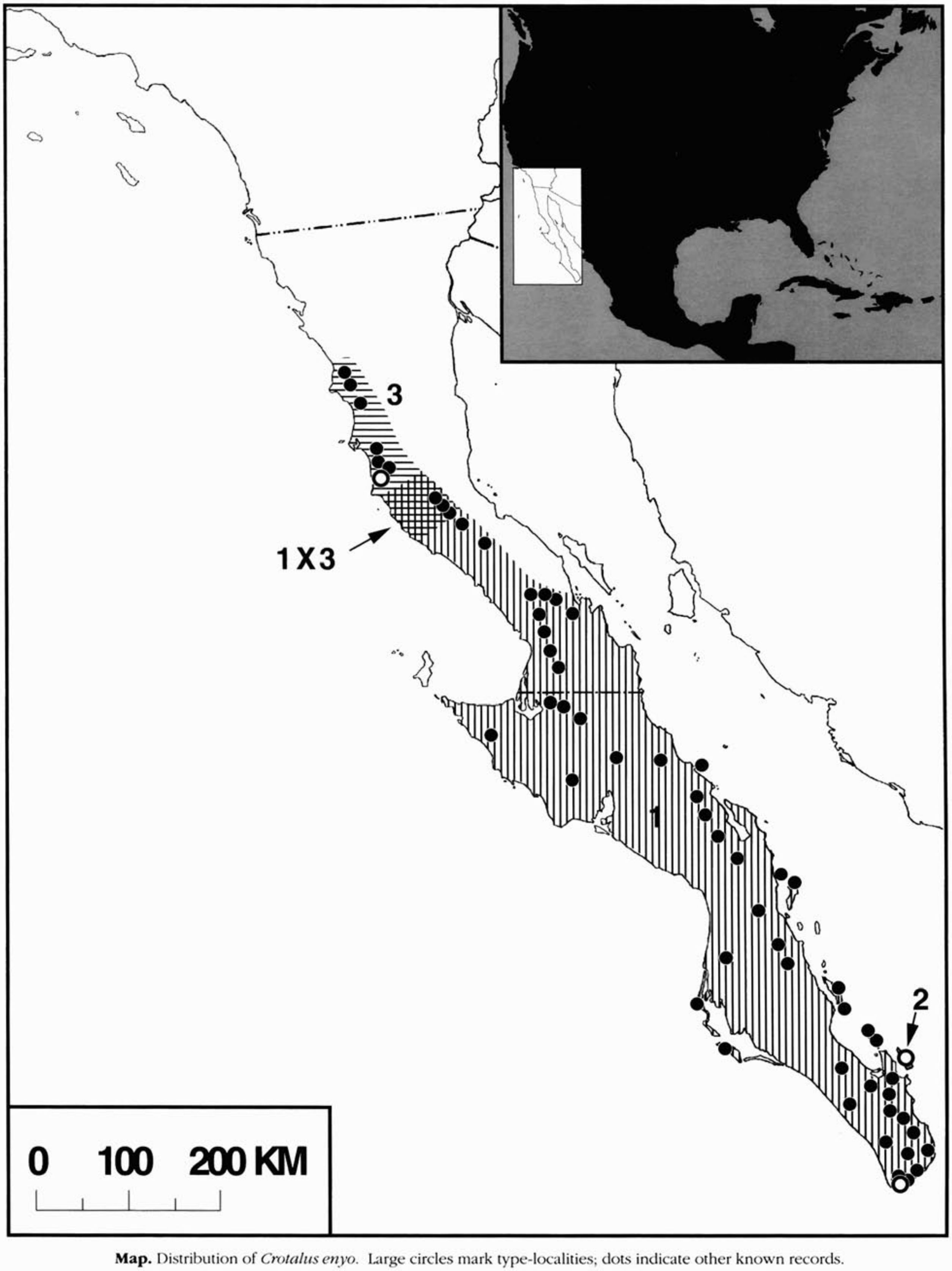


Figure 1. *Crotalus enyo enyo* from Sierra Santa Clara, Baja California Sur, México.

and *C.e. cerralvensis* were published by Lowe and Norris (1954) and Cliff (1954), respectively. Mehrtens (1987) illustrated *Crotalus e. enyo* in color. Color photographs of all three subspecies appeared in Campbell and Lamar (1989). A color photograph of *C.e. furvus* was published by Scheidt and Tashjian (1990).

• **Distribution.** This species is found on the peninsula of Baja California, México, from the vicinity of Cabo Colonet in northwestern Baja California south to Cabo San Lucas, Baja California Sur. *Crotalus enyo* occurs on the following islands in the Gulf of California: Carmen, Cerralvo, Los Coronados, Espíritu Santo, Partida Sur, San



Map. Distribution of *Crotalus enyo*. Large circles mark type-localities; dots indicate other known records.

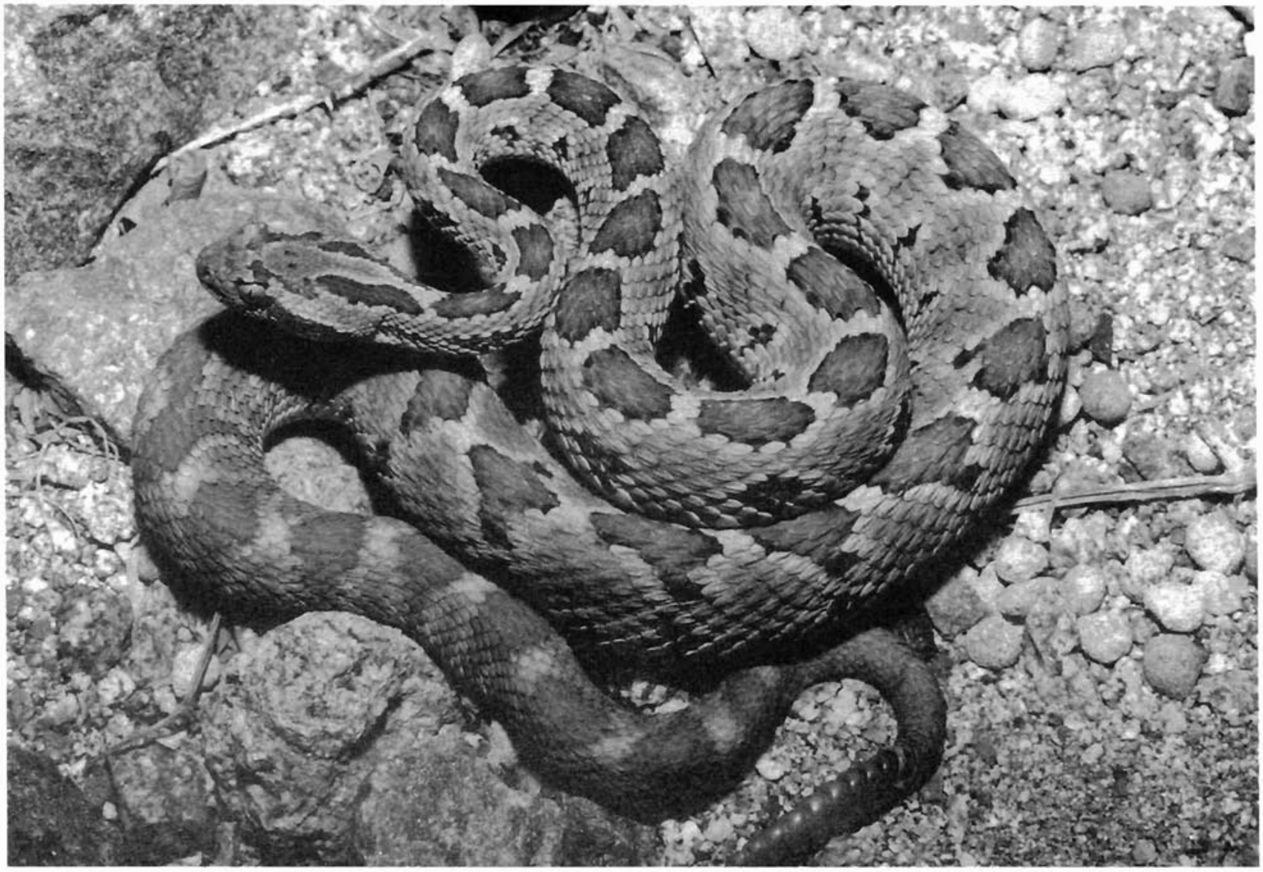


Figure 2. *Crotalus enyo cerralvensis* from Isla Cerralvo, Baja California Sur, México.



Figure 3. *Crotalus enyo furvus* from El Rosario, Baja California, México.

Francisco, San José, and San Marcos; and on Magdalena and Santa Margarita islands along the outer (Pacific) coast of the peninsula.

• **Fossil Record.** None.

• **Pertinent Literature.** Yarrow (1875) diagnosed *C. enyo* from other North American taxa. Amarál (1929) compared *C. enyo* to *C. viridis*. Klauber discussed morphological comparisons with *C. tigris* (1931) and other rattlesnakes (1936b, 1937, 1939, 1940, 1943, 1952). Lowe and Norris (1954) and Cliff (1954) discussed subspecific differentiation within *C. enyo*. Phylogenetic relationships based on immunological evidence, serology, and microdermatoglyph-ics were discussed by Cadle (1992), Minton (1992), and Stille (1987), respectively. Smith and Smith (1976) provided an index to the literature on *C. enyo*. Various aspects of its biology are treated in the following references: feeding behavior (Van Denburgh and Slevin, 1921; Radcliffe et al., 1980; Chizar et al., 1992), venom (Githens and George, 1931; Hoge and Romano, 1971; Brown, 1973; Glenn and Straight, 1982), evolution (Brattstrom, 1964), ecology (Case, 1983), reproduction (Tryon and Radcliffe, 1977; Armstrong and Murphy, 1979), and natural history (Armstrong and Murphy, 1979; McGuire, 1991).

The following authors list its occurrence in Baja California: Yarrow, (1883), Belding (1887), Cope (1896), Cuesta Terrón (1919, 1921, 1931), Nelson (1922), Schmidt (1922), Blanchard (1924), Ditmars (1930, 1931, 1936, 1939), Lindsdale (1932), Stejneger and Barbour (1943), Wright and Wright (1957), Etheridge (1961), Banks (1962), Lindsay (1964), Leviton and Banta (1964), Hoge (1966), Smith and Taylor (1966), Russell (1969), Bostic (1971), Klauber (1971), Loomis et al. (1974), Hoge and Romano-Hoge (1978-79), Reynoso (1990), Grismer (1994) and Grismer et al. (1994). Martin del Campo (1935, 1937, 1950) documented the species' distribution in Baja; Cliff (1954), Soulé and Sloan (1966), and Murphy and Ottley (1984) the distribution on the islands in the Gulf of California. Murray (1955) reported occurrence and distribution, and discussed the species' origin in Baja California. Savage (1960), Murphy (1983a, 1983b) and Grismer (1994) discussed its origin and evolution in Baja California.

• **Remarks.** The original description by Cope (1861) listed the "Type" as 4663. He also stated that "specimens have been sent to the Philada. Academy and Smithsonian Institute." Gloyd (1940), Klauber (1931, 1956, 1972), and Smith and Taylor (1945) listed USNM 5291, as a "co-type." USNM 5291 was originally assigned to three specimens ("338, 432, 788") of *Caudisona*, collected at "Cape St. Lucas" by "J. Xantus" (items in quotes are from the original catalogue entry of 6 February 1861). The entry was subsequently modified (Stejneger's handwriting, no date) to indicate that 338 (it may be 838) and 432 were the types of *Crotalus enyo* and 788 the type of *C. mitchellii* (G. Zug, in litt., 1990). After reviewing the original description, we determined that Cope based his description on one specimen. The total lengths of all three *C. enyo* specimens were compared (catalogue numbers and lengths) and herein we designate ANSP 7159 as the lectoholotype, as it best fits Cope's original description. In regard to the sex of the lectoholotype, Cadle (pers. comm., 1991) stated that the tail was sufficiently damaged to make the determination of sex impossible. He compared the ventral (162) and subcaudal (27) scale counts with those of Klauber (1956, 1972), and judged that the type specimen was a male. Some controversy exists over the correct number assigned to the type specimen in the Philadelphia Academy of Natural Sciences. Amarál (1929) stated "the type is mislabeled No. 7159 although the tag bears the correct No. 7059." Smith and Taylor (1945) also listed 7059. The specimen bears a tag with 7059, but clearly the correct number should be 7159, as entered in the catalogue, which contains the correct data for the John Xantus specimen. ANSP 7059 was assigned to a specimen of *Crotalus viridis*, and there a specimen bears a tag with that number. Thus, tag 7059 is duplicated. A specimen bearing a tag 7159 has yet to be found, so an error in stamping a tag for the type of *C. enyo* seems evident (J. Cadle, in litt., 1990). We also point out two pagination errors regarding the citation of the original description by Cope (1861). Klauber (1956, 1972) listed the page as 203, whereas Smith and Taylor (1945) listed page 294. The correct page is 293.

• **Etymology.** The name *enyo* (Greek) refers to the "goddess of war," the mother of Ares, in late Greek mythology. The name *cerralvensis* is in reference to Cerralvo Island, Gulf of California, México, where the subspecies is endemic. The name *furvus* (Latin) means "swarthy" or "being of dark color or complexion" or "dusky," referring to this subspecies' dark coloration.

1. *Crotalus enyo enyo* (Cope)
Baja California Rattlesnake

Caudisona enyo Cope, 1861:293. See species synonymy.
Crotalus enyo enyo: Lowe and Norris, 1954:54.

• **Definition.** This subspecies is characterized by having the third and fourth supralabials often in contact with the lacunal scale and subfoveals usually absent. Two to three scales are present between the orbit and supralabials, and dorsal scale rows at midbody are 23-27. Ventrals are 157-174 in males and 161-177 in females; subcaudals are 22-28 in males and 18-23 in females. Overall coloration is light gray to dark brown.

2. *Crotalus enyo cerralvensis* Cliff
Isla Cerralvo Rattlesnake

Crotalus enyo cerralvensis Cliff, 1954:82. Type-locality, "Isla Cerralvo in the Gulf of California." Holotype, formerly Stanford University (SU) 14021, now California Academy of Science (CAS-SU) 14021, collected by J. Figg-Hoblyn, J.M. Savage, and F.S. Cliff on 3 April 1952 (not examined by authors).
Crotalus cerralvensis: Hoge and Romano, 1971:269.

• **Definition.** This subspecies is characterized by having the third and fourth supralabials contacting the lacunal scale, subfoveals usually absent, two to three scales between the orbit and supralabial, and dorsal scale rows at midbody 23-25. This subspecies is also characterized by having a higher number of ventral (167-177 in males and 181 in females) and subcaudal (27-31 in males and 23 in females) scales. The overall coloration is pale orange to butterscotch.

Cliff (1954) states that *C.e. cerralvensis* is discretely diagnosed from all other *C. enyo* on the basis of its larger head to body length ratio (28.9-32.5 vs. 22.5-25.8 for *C.e. enyo* and 21.8-22.9 for *C.e. furvus*). However, the ratio for *C.e. furvus* was based on total body length (SVL plus tail length [Lowe and Norris, 1954]), thus this relatively small value, as compared to *C.e. enyo*, would be larger had only body length (SVL) been used.

3. *Crotalus enyo furvus* Lowe and Norris
Dusky Baja California Rattlesnake, Rosario Rattlesnake

Crotalus enyo furvus Lowe and Norris, 1954:52. Type-locality, "10.9 miles (by road) north of El Rosario, along the main road on the coastwise terrace near the foot of a bold Cretaceous escarpment, Baja California Norte, Mexico." Holotype, Museum of Vertebrate Zoology, University of California, Berkeley (MVZ) 553388, an adult male collected by K.S. Norris and C.H. Lowe, Jr. on 21 July 1949 (not examined by authors).
Crotalus furvus: Hoge and Romano, 1971:269.

• **Definition.** This subspecies is characterized by usually having the third and fourth supralabials not in contact with the lacunal(s) and wholly or partly separated by 1-3 subfoveals (absent in *C.e. enyo* and *C.e. cerralvensis*). Three scales (average) are present between the orbit and supralabials (2-3 in the other forms). The dorsal scale rows at midbody are 25. Ventrals are 159-162 in males and 165-171 in females; subcaudals are 26-29 in males and 18-20 in females. Overall coloration is dark brown.

• **Comments.** We agree with Frost and Hillis (1990) in that classifications should be consistent with the theory of evolution and reflect the recoverable history of lineage formation. The current classification of *Crotalus enyo* is not consistent with this philosophy. *Crotalus e. furvus* and *C.e. enyo* are not completely diagnosible from one another and intergrade widely in northern Baja California (Grismer, 1994). Thus, their nomenclature represents the geographic distribution of selected characteristics of the pattern classes which they form and not diagnosible lineages. To be consistent with the evolutionary history of the lineages within this group of rattlesnakes, these two pattern classes should be considered as the binomial *C. enyo*. Conversely, *C.e. cerralvensis* represents a diagnosible allopatric lineage, on the basis of its larger head and overall coloration, thus suggesting that it is on its own phylogenetic trajectory (i.e., no evidence exists to suggest that this lineage is exchanging genes with *C. enyo*). This population would best be considered as a full species, *C.cerralvensis*. Such a classification will be formally proposed and expanded upon elsewhere.

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Kent R. Beaman, Section of Herpetology, Natural History Museum Los Angeles, 900 Exposition Blvd., Los Angeles, CA 90007, and **L. Lee Grismer**, Department of Biology, San Diego State University, San Diego, CA 92182.

Primary editor for this account, Larry David Wilson.